

# Science

## ADVANCED SCIENCE QUALITATIVE ANALYSIS SEMESTER II

### STANDARD 1

*The student understands and uses scientific concepts and principles.*

**To meet this standard, the student will:**

**Benchmark ASII.1.1: Use properties to identify, describe, and categorize substances, materials, and objects**  
**Indicators:**

- ASII.1.1.1 Describe objects using sensory terms and properties including shape, size, color, texture, and hardness
- ASII.1.1.2 Sort substances by measuring properties such as density, hardness, boiling and freezing points, solubility, conductivity, Ph, and melting points
- ASII.1.1.3 Examine properties of mixtures, solutions, acids, and bases
- ASII.1.1.4 Determine, and understand the importance of concentration of solutions
- ASII.1.1.5 Identify the phase of matter associated with a substance at a particular temperature
- ASII.1.1.6 Distinguish between ionic and covalent bonds, and metallic bonds
- ASII.1.1.7 Distinguish different types of chemical reactions including synthesis, decomposition, single and double replacement, neutralization, redox, exothermic, endothermic, spontaneous, and non-spontaneous
- ASII.1.1.8 Use molar mass, molar volume, and Avogadro's principle to investigate stoichiometric relationships
- ASII.1.1.9 Investigate the relationships among pressure, temperature, and volume for gases
- ASII.1.1.10 Determine electron configuration, notations, electron dot notation, and orbital notation
- ASII.1.1.11 Distinguish the different orbital shapes

**Benchmark ASII.1.2: Identify, describe, and categorize objects and ideas based on their characteristics**

**Indicators:**

N/A

**Benchmark ASII.1.3: Measure properties and characteristics**

**Indicators:**

- ASII.1.3.1 Use instruments to measure time, temperature, mass, weight, and volume
- ASII.1.3.2 Identify and manage sources of error and uncertainty
- ASII.1.3.3 Use estimation skills to check measurements
- ASII.1.3.4 Understand the goals of measurement and the usefulness of standard measurements

*Key: 1, Discipline 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator*

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**Benchmark ASII.1.4: Recognize the components, structure, and organization of systems and the interconnections within and among them**

**Indicators:**

- ASII.1.4.1 Distinguish among an element, a compound, and a mixture
- ASII.1.4.2 Distinguish between physical and chemical properties
- ASII.1.4.3 Recognize the usefulness of the periodic table as an organizational and informational tool
- ASII.1.4.4 Distinguish between physical changes and chemical changes

**Benchmark ASII.1.5: Understand that interactions within and among systems cause changes in matter and energy**

**Indicators:**

N/A

**Benchmark ASII.1.6: Construct and use models to predict, test, and understand scientific phenomena**

**Indicators:**

- ASII.1.6.1 Recognize, interpret, and balance chemical equations
- ASII.1.6.2 Use mathematical models to make predictions about chemical reactions

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## ADVANCED SCIENCE SEMESTER II

### STANDARD 2

The student *conducts scientific investigations to expand understanding of the natural world.*

To meet this standard, the student will:

#### **Benchmark ASII.2.1: Plan and implement scientific investigations**

##### **Indicators:**

- ASII.2.1.1 Distinguish between an observation and an inference
- ASII.2.1.2 Draw inferences based on observations
- ASII.2.1.3 Develop questions and testable hypotheses in response to observations
- ASII.2.1.4 Use appropriate tools to collect data and test a hypothesis
- ASII.2.1.5 Plan and conduct a controlled experiment, individually and collaboratively
- ASII.2.1.6 Develop and communicate descriptions, results, explanations, conclusions, and models from evidence
- ASII.2.1.7 Understand and follow proper safety procedures

#### **Benchmark ASII.2.2: Think logically, analytically, and creatively**

##### **Indicators:**

- ASII.2.2.1 Approach questions and problems using several different strategies
- ASII.2.2.2 Distinguish between evidence, explanation, and opinion
- ASII.2.2.3 Make predictions and create explanations by drawing inferences and recognizing patterns and relationships (especially mathematical relationships)
- ASII.2.2.4 Reflect upon the thought process associated with a particular series of actions

#### **Benchmark ASII.2.3: Practice the principles of scientific inquiry**

##### **Indicators:**

- ASII.2.3.1 Recognize the role of science as a way of looking at the world
- ASII.2.3.2 Evaluate and modify processes of investigation
- ASII.2.3.4 Accurately record and report a series of observations
- ASII.2.3.5 Give proper credit to informative sources
- ASII.2.3.6 Explain the importance of openness, honesty, and skepticism in science
- ASII.2.3.7 Analyze information that is known and recognize what is still unknown or unanswered
- ASII.2.3.8 Recognize the logical process of basing conclusions on evidence
- ASII.2.3.9 Recognize that scientific knowledge is always changing
- ASII.2.3.10 Recognize that observations can be influenced by faulty procedures and by the beliefs of the observer
- ASII.2.3.11 Recognize that scientific understanding can come from unexpected results
- ASII.2.3.12 Analyze basic assumptions held by scientists

#### **Benchmark ASII.2.4: Understand the relationship between evidence and scientific explanation**

##### **Indicator:**

- ASII.2.4.1 Understand that the process of science results from inventive acts of imagination, intelligence and logical inquiry which meet certain criteria of testability, consistency, and rules of evidence

Key: 1, Discipline 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator

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## ADVANCED SCIENCE SEMESTER II

### STANDARD 3

*The student applies science knowledge and skills to solve problems and meet challenges.*

To meet this standard, the student will:

**Benchmark ASII.3.1: Identify problems and challenges in which science knowledge and skills can be applied**

**Indicators:**

- ASII.3.1.1 Analyze a relevant problem or challenge which is related to science or technology
- ASII.3.1.2 Identify the components of the problem and criteria of a suitable solution

**Benchmark ASII.3.2: Research, design, and test a variety of ways to address problems and/or challenges**

**Indicator:**

- ASII.3.2.1 Use scientific tools and methods to individually and collaboratively research, design, test, and compare alternative solutions to a problem

**Benchmark ASII.3.3: Evaluate solutions and consequences**

**Indicator:**

- ASII.3.3.1 Develop a written report which completely describes the problem-solving process

*Key: 1, Discipline 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator*

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## ADVANCED SCIENCE SEMESTER II

### STANDARD 4

*The student uses effective communication skills and tools to build and demonstrate understanding of science.*

To meet this standard, the student will:

**Benchmark ASII.4.1: Use listening, observing, and reading skills to obtain scientific information**

**Indicators:**

- ASII.4.1.1 Practice listening to and paraphrasing someone describe his/her own observations
- ASII.4.1.2 Read, understand, and summarize informative text

**Benchmark ASII.4.2: Use writing and speaking skills to organize and express science ideas**

**Indicators:**

- ASII.4.2.1 Construct, interpret, and utilize line graphs and other graphical displays of information
- ASII.4.2.2 Write informative reports that make use of formulas, symbols, diagrams, tables, and graphs
- ASII.4.2.3 Recognize, use, and be able to explain common science terms

**Benchmark ASII.4.3: Use effective communication strategies and tools to prepare and present science information**

**Indicators:**

- ASII.4.3.1 Utilize computer software and hardware to conduct scientific research and investigations
- ASII.4.3.2 Recognize and interpret chemical equations
- ASII.4.3.3 Clearly present information as evidence to support a conclusion

Key: 1, Discipline 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator

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## ADVANCED SCIENCE SEMESTER II

### STANDARD 5

*The student understands how science knowledge and skills are connected to other subject areas and real-life situations.*

To meet this standard, the student will:

**Benchmark ASII.5.1: Use mathematics to enhance scientific understanding**

**Indicator:**

ASII.5.1.1 Use statistical methods and estimation skills to make predictions and describe and analyze results

**Benchmark ASII.5.2: Understand the relationship between science and technology**

**Indicators:**

ASII.5.2.1 Describe workplace situations which utilize scientific inquiry and technological design processes

ASII.5.2.2 Explain the interdependence of science, technology, and public awareness

**Benchmark ASII.5.3: Examine the relationship between science and history**

**Indicator:**

ASII.5.3.1 Research and describe how individual contributions, various tools and techniques, and different historical periods and events have influenced the development of science

**Benchmark ASII.5.4: Examine the relationship among science, society, and the workplace**

**Indicators:**

ASII.5.4.1 Describe how the scientific enterprise is influenced by societal, environmental, economic, political, and ethical considerations

ASII.5.4.2 Explain how the actions of humans can affect the environment and the supply of resources

ASII.5.4.3 Recognize and explain some short-term and long-term consequences of science and technology

*Key: 1, Discipline 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator*

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## ADVANCED SCIENCE SEMESTER II

### STANDARD 6

*The student understands how science knowledge carries with it responsibility for its application.*

To meet this standard, the student will:

**Benchmark ASII.6.1:** Understand how science contributes to the treatment of diseases in the maintenance of a healthy lifestyle (Personal and Community Health)

**Indicator:**

N/A

**Benchmark ASII.6.2:** Understands how the use of resources affects population growth and the global environment (Population)

**Indicators:**

N/A

**Benchmark ASII.6.3:** Understand the importance of maintaining resources and environmental quality (Environmental Quality/Resources)

**Indicator:**

N/A

**Benchmark ASII.6.4:** Understand the ethical issues inherent in scientific research (Ethics)

**Indicator:**

ASII.6.4.1 Understand the importance of ethics in research as it relates to furthering scientific knowledge and in solving individual problems

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